



numeracy games with dice and cards for classrooms, clubs and home

this booklet belongs to:



contents

Games in the classroom, club and at home	3
Benefits	3
Competition vs. Collaboration	4
Introducing games into the classroom / club	4
Hints for successful classroom / club games	4
Scoring card games and choosing winners	4
Playing card games for younger learners	6
Playing card games for number bonds to 10 or 20	10
Playing card games for other operations	13
Some dice games for younger learners	24
Quick dice games	26
Longer dice games	31

Acknowledgements

The work of the South African Numeracy Chair project, Rhodes University is supported by the FirstRand Foundation (with the RMB), Anglo American Chairman's fund, the Department of Science and Technology and the National Research Foundation. Additional funding for club work and resources is provided by the Vestas Empowerment Fund.



This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. That means this booklet is freely available to anyone who wishes to use it and may not be sold on (via a website or other channel) or used for profit making of any kind.



To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>

Acknowledgement of sources

Please see last page of this booklet

Games in the classroom, club and at home

Benefits

There are numerous benefits to learning through games. These include:

- Creating **meaningful** situations for the application of mathematical skills
- **Motivation** – most children enjoy playing games
- **Positive attitude** - games provide opportunities for developing positive attitudes towards mathematics by reducing the fear of failure and error
- Increased learning - in comparison to more formal activities, greater learning can occur through games as a result of the increased interaction between children and provide opportunities to test intuitive ideas and problem solving strategies
- **Different levels** - games can allow children to operate at different levels of thinking and to learn from each other. In a group of children playing a game, one child might be encountering a concept for the first time, another may be developing his/her understanding of the concept, a third consolidating previously learned concepts
- **On-going assessment** - children's thinking often becomes apparent through the actions and decisions they make during a game, so the teacher has the opportunity to carry out diagnosis and assessment of learning in a non-threatening situation
- **Home and school** - games provide 'hands-on' interactive tasks for both school and home
- **Independence** - children can work independently of the teacher. The rules of the game and the children's motivation usually keep them on task.

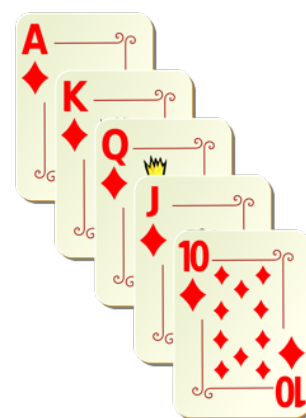
Mathematical games are 'activities' which:

- involve a challenge
- are governed by a set of rules and have a clear underlying structure
- normally have a distinct finishing point
- have specific mathematical cognitive objectives

Source: <http://nrich.maths.org>

Games taught and used in the classroom can potentially also be played at home and shared with family members, thereby allowing:

- learners to spend more time on maths
- learners to consolidate skills and practice what they have learnt in class
- learners to teach other people the rules
- other people to get involved in mathematics



competition vs. collaboration

Games can encourage *collaboration*, *communication* and *competition*. However, too much emphasis on competition can be counter-productive as the game becomes about the winning or losing and not the mathematics or the strategies. Emphasise collaboration and communication more often than competition.



Introducing games into the classroom / club

In teaching games to large groups Gillian Hatch has found three different methods that work well.

- Introduce the game to one group of learners while the others are completing some individual work.
- Then divide the whole class into groups. Put one learner from the initial group into each group to teach the game to the group. Divide the class into the groups in which they will subsequently play. Play the game with the whole class, with each group acting as a single player.
- Choose a set of learners to come to the front of the class and play the game as a demonstration, possibly with assistance in decision making from the whole class.

Source: <http://nrich.maths.org/2928/index>



Hints for successful classroom / club games

- Make sure the game matches your mathematical objective(s)
- Use games for specific purposes, not just time-fillers
- Keep the number of players from 2 to 4, so that turns come around quickly
- The game should have enough of an element of chance so that it allows weaker students to feel that they a chance of winning
- Keep the game completion time short

Source: <http://nrich.maths.org>

scoring card games and choosing winners

As a way to avoid winners always being the person with the highest scores, we have devised some ways to make winning different.

- Rather than highest score, go for lowest score, least number of cards and so on.
- The mathematical scorecard on the next page can be used in a variety of games. Its use is explained in some of the games below.



Photocopy and cut into 4 scorecards

SCORECARD LESS THAN < 30 2 points BETWEEN 31 and 79 1 point MORE THAN > 80 3 points				SCORECARD LESS THAN < 30 2 points BETWEEN 31 and 79 1 point MORE THAN > 80 3 points			
NAME x SUM	SCORE	NAME x SUM	SCORE	NAME x SUM	SCORE	NAME x SUM	SCORE
TOTAL		TOTAL		TOTAL		TOTAL	

SCORECARD LESS THAN < 30 2 points BETWEEN 31 and 79 1 point MORE THAN > 80 3 points				SCORECARD LESS THAN < 30 2 points BETWEEN 31 and 79 1 point MORE THAN > 80 3 points			
NAME x SUM	SCORE	NAME x SUM	SCORE	NAME x SUM	SCORE	NAME x SUM	SCORE
TOTAL		TOTAL		TOTAL		TOTAL	

Playing card games for younger learners

playing card sort

Skill : Pattern (subitising) and number recognition, developing flexibility and working memory	You need: 1 deck of cards per pair / group. When you first play the game take out the 7 to 10 cards, picture cards and jokers	Learners work with a partner
--	--	------------------------------

- Shuffle the cards.
- Ask the children to find a way to sort the cards. Give the child some time to think about how they could sort the cards. If they are stuck, you could give some suggestions from the box to the right.
- Once they have sorted their cards ask them to say how they sorted them (e.g. by numbers, by colours, or by the pictures (diamonds, clubs, hearts etc.))
- Once they have chosen a way to sort the cards, ask them to sort the cards in a different way

IDEAS FOR SORTING CARDS

- By colour (black / red)
- By suit (Diamonds / Hearts / Spades / Clubs)
- By numbers
- By pictures and numbers
- By odd and even (older learners)



variation and extension

Once learners are familiar with sorting you can extend the card range from 1 to 10 and later you can include picture cards with different values (i.e. start with all picture cards = 10, or J = 11; Q = 12; K = 13)

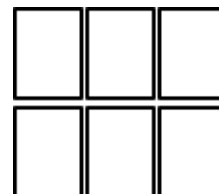


memory (concentration)

Skill: Number recognition, subitising, developing working memory	You need: 1 pack of cards WITHOUT picture cards. You can include the Jokers for a bit of colour if you want.	Learners work with a partner or in a small group of up to 3
--	--	---

Preparation

- Select any three pairs of identical cards (e.g. 2 jokers; 2 five of clubs; 2 Aces of hearts)
- Mix the cards up and arrange the cards **face down** in 2 rows of 3 as shown



Play

- Players take turns turning over a pair of cards. If the cards match, the player wins the two cards and takes another turn
- If the cards do not match, they're flipped **face down** and the next player has a turn
- Play continues until all number matches are found

Extension

Once learners are fluent with 3 pairs, extend this to different (even numbered) arrays of pairs of cards, such as 5 by 2, 4 by 4 and so on

snap

Skill: Number recognition, subitising, developing working memory, inhibition	You need: 1 deck of cards per pair / group. When you first play the game take out the 6 to 10 cards, picture cards and jokers	Learners work with a partner or on a group of 3 or 4.
--	--	---

Preparation

- Decide what the object of the game will be:
 - Matching numbers (dots) on the cards
 - Matching suit on the cards
 - Matching colours on the cards
- Shuffle the cards and deal the cards out equally to all players, **face down**
- Learners must make their cards into a pile, still keeping them face down

Play

- One learner starts by placing the first a card from the top their pack into the centre of the table, face up
- The next player does the same. If the card matches the requirements, that learner takes the pile and adds it to their pack.
- If there is not a match, play continues, with each learner taking a card from their pack and placing it in the pack in the centre of the table.

variations and extension

Once learners are fluent with recognising pairs of cards in this range, gradually extend the game to include all cards in the pack but only once this has been supported through other representations such as bead strings, 10-frames and unifix blocks.



notes

ordering cards

Skill: Number sequencing (forward and backward number sequences)	You need: 1 deck of cards per pair / group. Take out cards from 6 to 10, picture cards and jokers. Ace = 1	Learners work in a group of 4
--	---	-------------------------------

- **Sort** the cards by suit
- Give one suit of 5 cards to each child. Explain to learners that the Ace is one
- Learners sort their cards:
 - First from smallest to largest (1 to 5)
 - Then from largest to smallest (5 to 1)
- Follow this up with asking players:
 - Point to four, three etc.
 - Say how many cards there are altogether
 - Point to four for example. What comes before? What comes after?

variation

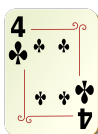
- Sequence from 1 to 10 using 10 cards



make 5

Mathematical object of learning: Making number bonds to 5 (working with five as a base)	You need: 1 deck of cards per pair / group. Take out cards from 6 to 10, picture cards and jokers.	Learners work in a group of 3 or 4
--	--	------------------------------------

- Deal out the cards equally to all players. Explain to learners that the Ace is one
- First child picks a card from their pile and places it in the middle of the table



For example

- Other learners must look in their piles to see if they have a (or number of) card of any suit that will go with the selected card to make 5. Connect this to their knowledge of the bonds to 5 developed through other activities.



For example

or

- The cards in the middle of the table must never make more than 5.
- Players put the cards back in their piles.
- Next child pulls a card out and others must again find a card that makes 5.

Extension

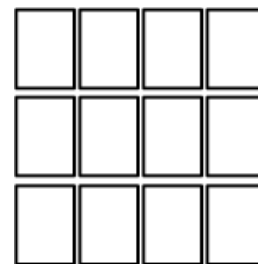
Extend learners to make another number such as 6 but only once this has been supported through other representations such as bead strings, 10-frames and unifix blocks.

Playing card games for number bonds to 10 or 20

make ten!

Skill: Addition, fluency & efficiency with numbers up to 10	You need: 1 set of playing cards without Jokers or picture cards per pair	Work: on your own or with a partner
---	---	-------------------------------------

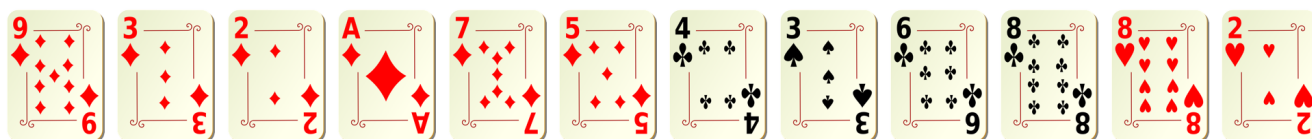
- Place 12 cards **face up** in a 3 rows of 4
- Take turns choosing a set of cards which add to 10
- Fill in the spaces with new cards
- Play continues until no more sets of ten can be found
- The winner is the player who finishes with the most cards
- When a player plays alone, the object of the game is to find the maximum number of cards that have a sum of ten



give me 10

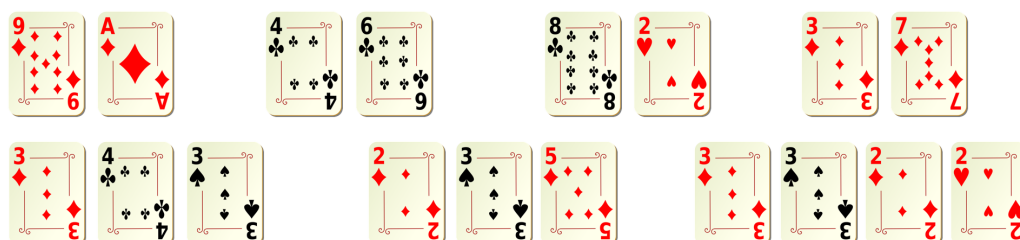
Skill: Addition, fluency & efficiency with numbers up to 10	You need: 1 pack (or half a pack) of playing cards per pair with Jokers or picture cards removed	Work: on your own or with a partner
Source: http://www.pepnonprofit.org/uploads/2/7/7/2/2772238/acing_math.pdf		

- Place 12 cards **face up** in a row like this



- Take turns to find **sets** of cards that add up to 10

For example:



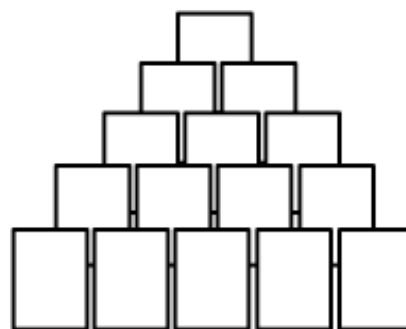
- When no more sets are possible, deal other cards in the spaces you have made and continue playing
- The winner is the person with the most / least cards / a score over 100 etc. (See page 4)

pyramid

The aim of the game is to remove as many cards from the pyramid as possible. Only cards that are "free" (not covered by other cards) may be used.

Skill: Addition, fluency & efficiency	You need: 1 pack of cards per pair All picture cards = 10, Ace = 1	Work: on your own or with a partner
Adapted from http://www.education.com/activity/article/secrets-of-the-great-pyramid/ & personal experience		

- Lay out 15 cards **face up**, into the shape of a pyramid, as shown (5 rows)
- Keep the rest of the pack **face up** on the table
- Look for pairs of cards in the pyramid or on the top of the pile that make 10.
- Remove these from the pyramid or the pile and put to one side
- Keep looking for free cards that make 10. If you cannot find any in the pyramid, turn over 1 card from the pack. The pack can be used with cards from the pyramid to add to 10



variations

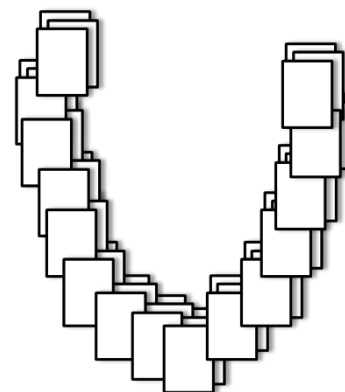
- Find pairs that add to 11
- Find pairs that add to 12
- Find pairs that add to 13: King = 13, Queen = 12, Jack = 11, Ace = 1



horse shoe (Dingaan's kraal)

Skill: fluency in basic number facts.	You need: 1 pack of cards per pair/group. All picture cards = 10, Ace = 1	Work with: a partner, a small group or in 2 teams
---------------------------------------	---	---

- Spread all the cards out in a horseshoe shape, **face down**
- Take turns to turn over one random card and lay it in the middle of the shape
- As a new card is laid down find pairs / sets of cards that add to 10
- Take the cards that add to 10 from the middle of the shape
- Next learner takes a turn



variations

Add to 20, 30 etc.

near 20

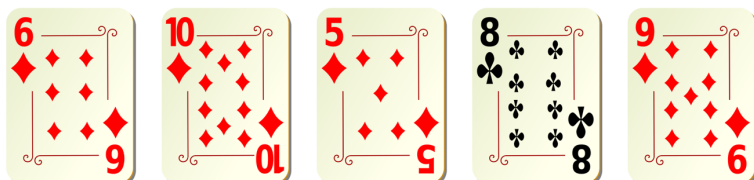
The aim of this game is to use cards to get as near to 20 as possible.

Skill: Addition, fluency & efficiency	You need: 1 deck of cards per pair Ace = 11, Jack = 12, Queen = 13, King = 14, scrap paper	Work with: a partner, a small group or in 2 teams
Source: http://www.K-5MathTeachingResources.com		

- Deal five cards to each player
- Each player chooses **three** cards that add to 20, or near to 20

For example

If the player has



Using **3** cards, the player can make 19 from



$$5 + 6 + 8 = 19$$

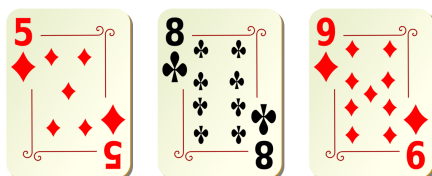
- Each player writes their sum on scrap paper and works out their score (see below)
- Play either 5 or 10 times depending on how much time you have
- The winner can be the player with the lowest score, the highest score and so on. (See page 4)

Scoring

How many more do you need to get to 20?

Example:

Using the example from above, the player made 19. So the player needs 1 more to get to 20. The score is 1.



Siya picks the cards and writes $5 + 8 + 9 = 22$.

She needs 2 more to get to 20 going backwards. She scores 2.



notes

Playing card games for other operations

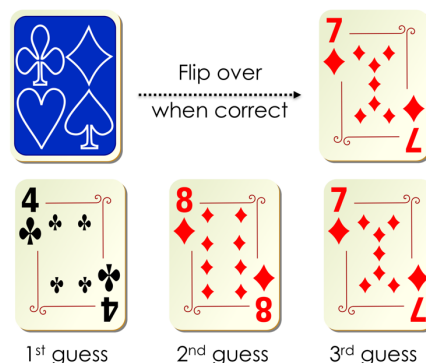
This section explains games that can be used for other operations such as subtraction and multiplication and also for other mathematical concepts such as logical reasoning, sequencing, number recognition and so on.

secret card

Skill: Number recognition, order and sequencing	You need: 1 pack of cards per pair/group with picture cards removed. Ace = 1	Work with: a partner, a small group
---	--	-------------------------------------

- Each player gets a set of cards from 1 (Ace) to 10
- One player selects a "secret card" from his/her hand and places it face down
- The second player tries to guess what the number on the card is by selecting a card from his/her hand and placing it face up
- The first player then says if the "secret card" is greater than or less than the face-up card
- The second player continues to make guesses by selecting and showing different cards until the value of the secret card is found
- Players swap around

example



match the dice and cards

Skill: Number recognition, order and sequencing	You need: 2 dice, 1 deck of cards with the picture cards removed	Work with: a partner
---	--	----------------------

- One player takes the red cards and the other takes the black cards
- Take turns
- On a turn, roll the dice and add the two together

Example

Roll a  and  which makes 8

- The player looks for cards in their hand to add up to that amount

For example

You can make 8 in many ways - $5 + 3$, $4 + 4$, $4 + 2 + 2$ and so on

- If a player cannot find the cards to make the sum with the cards in their hand, roll again
- If a player cannot make a sum after three tries, the player loses the game
- The winner uses all their cards or the other player cannot go 3 times

variations

Play with 3 or 4 dice and include the picture cards with values of: J=11, Q=12, K=13

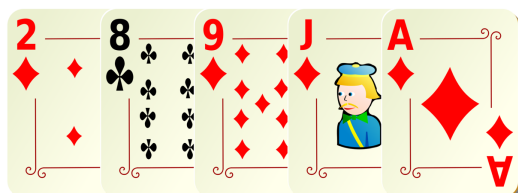


add 5 cards

Skill: 1 & 2 digit addition and addition strategies	You need: One deck (or half a deck) of playing cards per pair King = 13, Queen = 12, Jack = 11, Ace = 1	Work in pairs
---	--	---------------

Adapted from: <http://www.math-drills.com/addition.shtml#Games>

- Deal out 5 cards **face up** as shown in the example



- Both learners add up the values of the cards
- Check each other's totals and discuss the strategies used to add

variations

Use less cards for younger learners or take out picture cards

yes, no, you've got it

This is a game of logical thinking, where players need to ask logical and sequential questions to find out the value of a secret card.

Skill: logic, number sense	You need: 1 set of playing cards	Work in groups, teams or pairs
Source: http://www.education.com/activity/article/yes-no-you-got-it/		

- Decide who will go first
- This person draws 1 card from the deck at random and keeps it **secret**
- Other players take turns asking mathematical questions to find out what card was drawn
- The person with the card responds to each question with one of these choices: "**Yes**," "**No**," or "**You Got It!**"
- The player who correctly guesses the card value keeps that card and takes the next turn
- Play until one player has 5 cards

For example

The dealer chooses



Questions might go like this:

- Is the card black? (**NO**)
- Is the card between 6 and 10? (**NO**)
- Is the card greater than 3? (**YES**)
- Is the card a five? (**NO**)
- Is the card a two? (**NO**)
- Is the card a heart? (**NO**)
- Is the card a four of diamonds? (**YOU GOT IT!**)

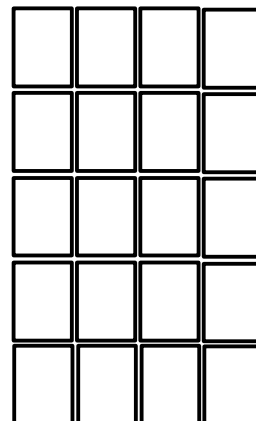


"i spy" sums

Skill: Addition, fluency & efficiency with numbers up to 10 (or any other chosen target number)	You need: One deck of playing cards per pair/group, scrap paper Ace = 1, picture cards = 10	Work: with a partner or group of 3 or 4
---	--	---

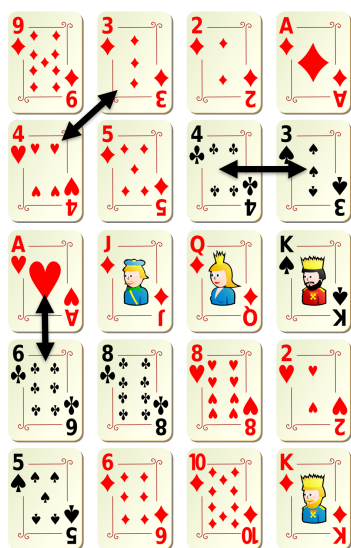
Source: *Acing Math (One Deck At A Time!): A Collection of Math Games*
(<http://www.pedagonet.com/quickies/acingmaths.pdf>)

- Deal out cards **face up** in 5 rows of 4
- One player challenges the other player (or player to his/her right) to find two cards next to each other, either vertically, horizontally or diagonally, that add to make a number by saying **"I spy two cards that add to 7"**
- The challenged player then looks for two cards that add to that number and picks up this pair



example

The 3 of spades and 4 of clubs; 3 of diamonds and 4 of hearts or 6 of clubs and Ace of hearts are next to each other (vertically, horizontally or diagonally) to add to 7



- If the second player misses any pair(s) that add to the chosen target number, then the first player may claim them
- Fill spaces with cards from the pack
- Players swap roles and continue until the cards are cleared
- The winner is the player with the most cards at the end of the game

variations

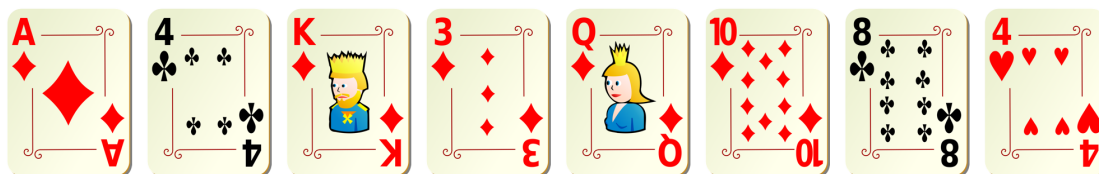
- Change the **target number**: 8, 10, 15 etc...
- Change the **value of the picture cards**: Jack = 12, Queen = 13, King = 14 to make it more challenging
- Multiply** 2 cards instead of adding by saying, "I spy two cards which multiply to make 40"

Flip Out

Skill: Efficient addition strategies	You need: One deck of playing cards per learner (or half a deck per learner) Picture cards = 10, Ace = 1, scrap paper Timer or some way to keep a track of time	Work: on your own and then with a partner
Source: <i>Acing Math (One Deck At A Time!): A Collection of Math Games</i> (http://www.pedagonet.com/quickies/acingmaths.pdf)		

- Players shuffle their decks and lay it **face down** on the desk
- The timekeeper calls out: '**Go!**'
- Player One flips over one card at a time and works out a running total of the values on the cards
- After thirty seconds, one minute, or two minutes (depending on the ability of the players), the timekeeper says, "**Stop!**"
- Players write down their running total
- Player Two checks Player One's total using other strategies (see below)
- The winner is the player with the highest total.
- If the players do not agree, the players must come to an agreement by checking again
- Play again

example set of cards



$$1 + 4 = 5$$

$$5 + 10 = 15$$

$$15 + 3 = 18$$

$$18 + 10 = 28$$

$$28 + 10 = 38$$

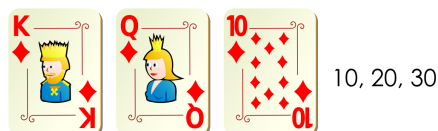
$$38 + 8 = 46$$

$$46 + 4 = 50$$

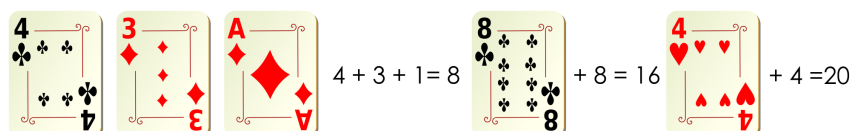
This set of cards gives a total of **50**

example strategy for checking total

1st group all cards with value of 10 together



Then group other cards to make more **friendly** numbers



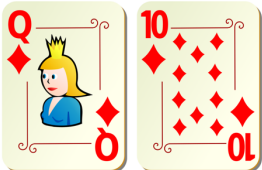
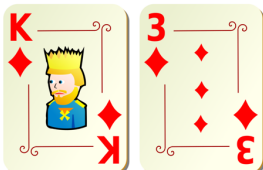
$$30 + 20 = 50$$

subtraction number battle

Skill: Number recognition and subtraction	You need: One deck of playing cards per pair Picture cards = ten, Ace = 1	Work: with a partner
---	--	----------------------

- Players share a deck of cards
- At the same time, each player flips over their top **two** cards and subtract the smaller number from the larger number

example

<p>Player 1:</p>  <p>$10 - 10 = 0$ Difference is 0</p>	<p>Player 2:</p>  <p>$10 - 3 = 7$ Difference is 7</p>
--	--

- The player with the largest difference, gets all the cards

In this example

This will be player 2

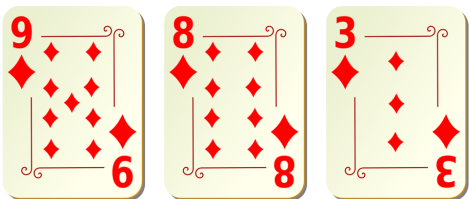
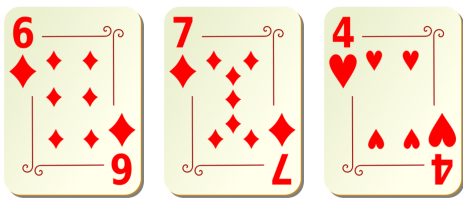
- If both players have the same differences, the cards are placed in a centre pile.
- The next round is played normally and the winner of the next subtraction number battle takes the centre pile as well

variation

Place value and subtraction

- Remove the 10s, picture cards and jokers from the pack
- Players share a deck of cards and flip over their top three cards at the same time
- Make two of them into a 2-digit number and subtract the third. Players may move the cards to place them in any position they wish
- Continue with the same rules as above

example



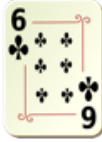

<p>Player 1:</p>  <p>Uses 9 and 8 to make 98 $98 - 3 = 95$</p>	<p>Player 2:</p>  <p>Uses 6 and 7 to make 67 $67 - 4 = 63$</p>
--	---

multiplication zone

Skill: Multiplication table practice	You need: One deck of playing cards per group King = 13, Queen = 12, Jack = 11, Ace = 1	Work: with a partner or groups of 4
--------------------------------------	--	-------------------------------------

- Each player gets 10 cards
- The rest of the pack is placed on the table. One card from the left over pile is turned face up

example

 Player one	 Rest of the pack	 Flipped card	 Player two
---	---	--	---



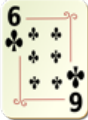

- Multiply this card by 10

For example

The flipped card is 6, multiplied by 10 = 60. So the players must find answers in 'the zone' between 60 and 69

- Players use their own cards to find 2 cards that multiply to be within that 'decade' zone

For example

 Player one	 Rest of the pack	 Flipped card	 Player two
Player one can make $9 \times 7 = 63$		$6 \times 10 = 60$	Player two can make $12(Q) \times 5 = 60$

- If a player can find two cards to arrive at an answer in the zone, they say the multiplication sum and take those cards out of their hand
- Flip over the next card from the pack and play again
- When one player finishes their cards, the game ends

variations

- Remove the picture cards from the pack and practice a limited range of multiplication tables
- Remove the 6, 7, 8, 9 and picture cards from the pack and practice the smaller multiplication tables such as 1, 2, 3, 4 and 5

2, 4 and 8

Skill: Multiplication table practice	You need: One deck of playing cards per pair, use just 2s, 4s and 8s, 1 x 12-sided dice (or 2 six-sided dice)	Work: with a partner
Source: Games devised in SANC project clubs (available http://www.ru.ac.za/sanc/mathclubs/clubresources/)		

- Place the cards face down on table between players and take turns

- Throw the dice e.g. 
- Pick up top card



e.g.

- Work out the multiplication sum and write it on score card below
e.g. $4 \times 4 = 16$
- Place card to one side
- After all the cards are used (6 turns each):
- Look at each sum's answer and work out the score
- Write the score next to each sum on the score card
- Add up the scores

For example

$6 \times 8 = 48$ will score 1 point as it falls between 31 and 79

example scorecard for this game

ANSWERS:

LESS THAN < 30	2 points
BETWEEN 31 and 79	1 point
MORE THAN > 80	3 points

NAME	Emilhe	NAME	Siya
x SUM	SCORE	x SUM	SCORE
$4 \times 4 = 16$	2	$7 \times 8 = 56$	1
$10 \times 4 = 40$	1	$6 \times 8 = 48$	1
$7 \times 2 = 14$	2	$8 \times 2 = 16$	2
$11 \times 8 = 88$	3	$3 \times 2 = 6$	2
$8 \times 2 = 16$	2	$8 \times 4 = 32$	1
$1 \times 8 = 8$	2	$9 \times 4 = 36$	2
TOTAL	12	TOTAL	4

Variations

- Use to practice 3s, 6s and 12 times tables
- Use to practice any set of tables

"i've got it"

The aim is to use a **multiplication operation every time** to make any of the target numbers. You can also use add, subtract or divide along with multiplication if required. To make it more accessible for younger learners, take out the picture cards and Jokers before the game starts.

Skill: Multiplication table practice and fluency with other operations, flexible thinking	You need: One deck of playing cards per group. King = 13, Queen = 12, Jack = 11. Jokers can be valued at whatever you want: 15, 20 etc.	Work: with a partner, or groups of 3 or 4 Give each group a pack of cards, scrap paper and a pencil
---	---	--

Source: Games devised in SANC project clubs (available <http://www.ru.ac.za/sanc/mathsclubs/clubresources/>)

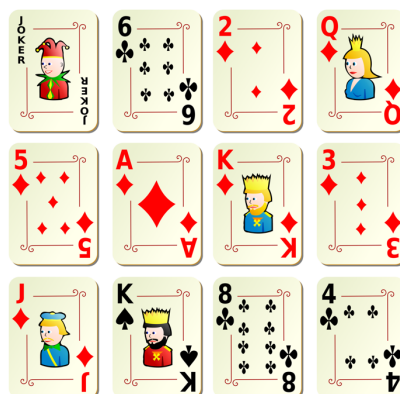
Suggested target numbers:

Start with 12, 18 and 24
(these include factors of 2, 3, 4, 6 and 8)

Progress to 24, 42 and 100
(these include factors of 2, 3, 4, 5, 6, 7, and 10)

Make up your own target numbers

- Lay out a single layer of cards in a 4 x 3 grid (as shown) or a 4 x 4 grid.
- In this example the Joker = 20 and the picture cards as described above
- Take turns to find a set of cards to make a target number
- Each player must explain their thinking to their partner or group
- Once the partner or group agree that the set of cards does equal a target number, the cards can be taken from the layout
- Write the sum on different sections on scrap paper
- See the example sums on the next page



notes

"I'VE GOT IT" (continued)

For example

Write the sums for making 12 in one place, the sums for 18 in another and for 24 in another. You can show learners how to use brackets or show them how to lay out the sums in stages. See the table below for some examples

- Fill in the gaps with more cards from the pack
- If learners are unable to make a target number with the cards in the layout, they can add another layer of cards on top and work with those
- When a learner finds a set that makes one of the target numbers, they can say "I/We've got it".
- If the group can use all the cards in the layout before adding more in the gaps, they can say "I/We've got them all!"

Examples of operations generated by learners for this layout of cards.

Target number: 12		Target number: 18		Target number: 24	
Bracket notation	Step notation	Bracket notation	Step notation	Bracket notation	Step notation
$3 \times 4 = 12$ $2 \times 6 = 12$ $(5 \times 3) - (2 + 1) = 12$ $(5+1) \times 2 = 12$ $(13+12) - (13 \times 1) = 12$	$5 \times 3 = 15$ $2 + 1 = 3$ $15 - 3 = 12$ $5 + 1 = 6$ $6 \times 2 = 12$ $13 + 12 = 25$ $13 \times 1 = 13$ $25 - 13 = 12$	$3 \times 6 = 18$ $(8 + 1) \times 2 = 18$ $((5 + 6) \times 2) - 4 = 18$ $(5 + 4) \times 2 = 18$ $(5 + 4) \times (4 - 2) = 18$	$8 + 1 = 9$ $9 \times 2 = 18$ $5 + 6 = 11$ $11 \times 2 = 22$ $22 - 4 = 18$ $5 + 4 = 9$ $9 \times 2 = 18$ $5 + 4 = 9$ $4 - 2 = 2$ $9 \times 2 = 18$	$6 \times 4 = 24$ $(3 + 1) \times 6 = 24$ $(5 + 1) \times 4 = 24$ $(20 \times 1) + 4 = 24$ $(13 + 12) - 1 \times 1 = 24$ $(20 \times 2) - (8 \times 2) = 24$	$3 + 1 = 4$ $4 \times 6 = 24$ $5 + 1 = 6$ $6 \times 4 = 24$ $20 \times 1 = 20$ $20 + 4 = 24$ $13 + 12 = 25$ $1 \times 1 = 1$ $25 - 1 = 24$ $20 \times 2 = 40$ $8 \times 2 = 16$ $40 - 16 = 24$





notes

TOSS!

Skill: Addition, subtraction, multiplication	You need: One deck of cards per group Ace = 11, Jack = 12, Queen = 13, King = 14, scrap paper	Work in: Groups of two or more
Source: <i>Acing Math (One Deck At A Time!): A Collection of Math Games</i> (http://www.pedagonet.com/quickies/acingmaths.pdf)		

- Each player draws three cards from the deck
- On the count of three, each player tosses their cards into the air. Make sure cards are not tossed too close to one another or too high

Addition Toss (Grades 2 to 5) <ul style="list-style-type: none"> • Players add their own cards that land face up • The first player to reach a designated amount of points wins (50 or 100) 	 <p>Add face up cards: $9 + 6 = 15$ or $6 + 9 = 15$</p>
Subtraction Toss (Grades 4 to 6) <ul style="list-style-type: none"> • Add the cards that land face up and then subtract the card(s) that are face down • Answers may go into the negatives, so only play this game if learners have been introduced to positive and negative integers • The first player to reach a designated amount of points wins (50 or 100) 	<p>Add face up cards: $9 + 6 = 15$</p>  <p>Subtract face down card: $15 - 5 = 10$</p>
Multiplication Toss (Grades 3 and above) <ul style="list-style-type: none"> • Multiply the cards that land face up • The first player to reach a designated amount of points wins (100 or 200) 	<p>Multiply face up cards: $9 \times 6 = 54$ or $6 \times 9 = 54$</p>



notes

some dice games for younger learners

5-Frame snakes and ladders


Skill : Becoming familiar with the structure of the 5-frame in a game context, patterns of the dice (subitising)	You need: <ul style="list-style-type: none"> • 1 game board (on page 25) • 1 dice • Different colour counters or items to move 	Learners work with a partner
Source: Game devised for SANC Early Number Fun programme http://www.ru.ac.za/sanc/teacherdevelopment/earlynumberfungrader2016-2017/enfsession8/		

- Use the game board on the next page
- Players start at 1
- Throw a dice
- Count the number of squares to move
- Follow the arrows to each number i.e. move from left to right across each row as you would with the 5-frame
- If you come to a ladder, go **UP**; if you come to a snake, go **DOWN**
- First player to 15 is the winner

Add One

- Play with a friend
- Throw a single dice and add 1 (count on 1)
- The winner is the person with the highest number
- Play again

example

Throw a 
Add 1 = 7

variations

- Add 2 more
- Take away 1

Which is bigger / more?

- Play with a friend
- 1st player throws 2 dice
- Player one must point to the dice with the bigger value / more and say why
- Player 2 has a turn

example

Throw a  and a 

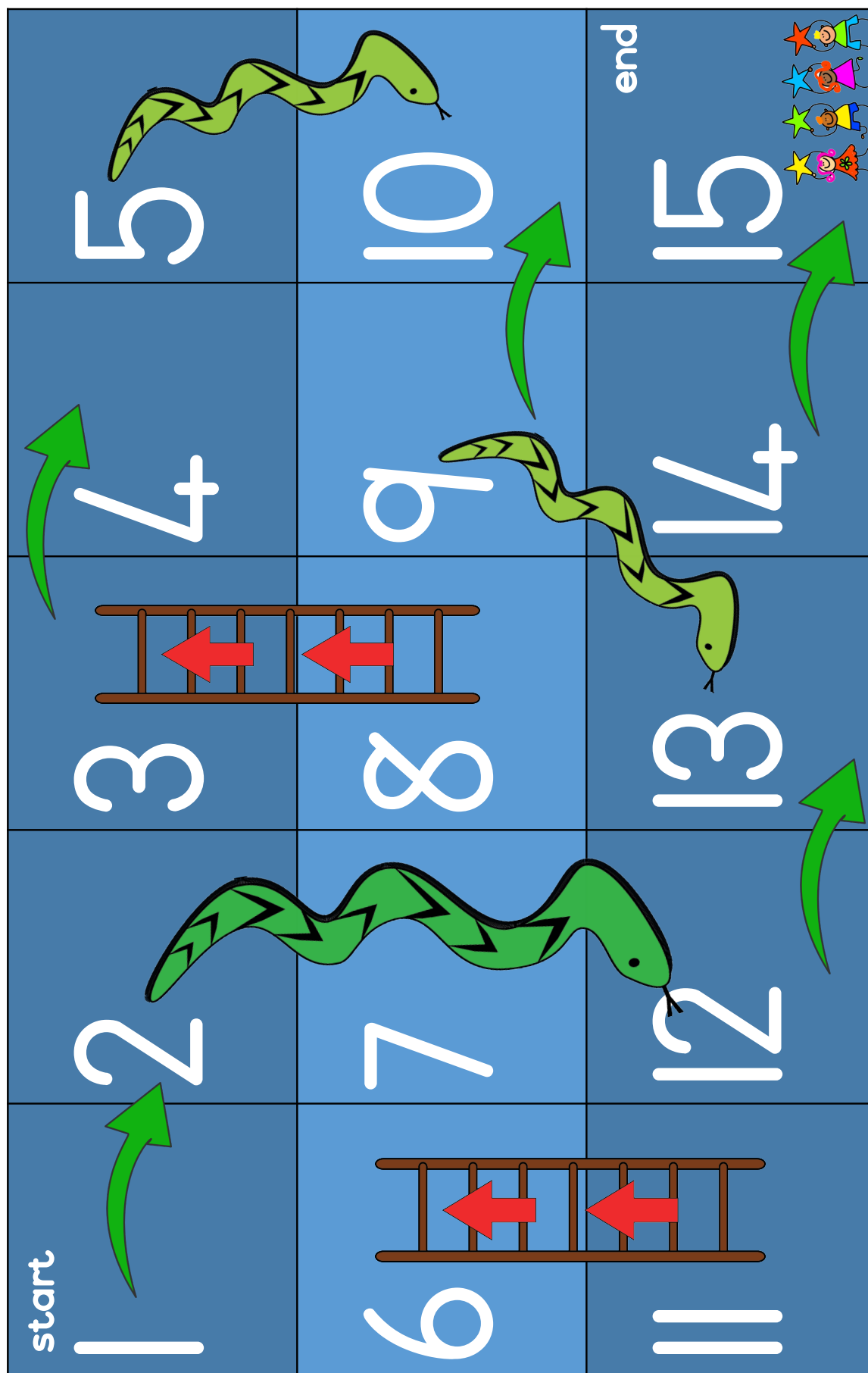
The 6 is bigger than the 4 or 6 is 2 more than 4

variations

- Say which is smaller / less and why



5-frame snakes and ladders



South African Numeracy Chair Project www.ru.ac.za/sanc

Quick dice games

These dice games are ideal for a short mental session at the beginning of class, club or at home before bed.

Knock Off numbers

You need: 1 dice, paper & pencil

- 1 learner throws 1 dice, other writes the number that is thrown
- Do this 10 times in total
- Learners' work together to add the numbers as quickly as possible using their own strategies



20 or bust!

- Throw 1 dice many times. Keep adding each time to get to **EXACTLY** 20. If your score adds to more than 20 you are bust! Start again

variations

Add to 30, 50 or 100.



add 10 or 100

Using any odd shaped dice i.e. those with more than 6 sides

- Each learner gets one odd shaped dice
- Roll the dice and keep the number in your head
- Then give them something to work out e.g. +10 or + 100
- What's your answer?
- Can you work out what the original number was by working backwards? e.g. -100, -10?



CROSS OUT

You need: 2 dice, pencils and paper. Play with a partner or on your own

- Each learner writes the numbers 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 on a piece of paper
- Take turns to roll two dice
- Add both numbers rolled
- Cross out the total on their piece of paper
- The first player to cross out all the numbers is the winner



how many to 20

- Throw two dice
- Add the numbers together and say how many more you need to make 20

example



$2 + 3 = 5$, $20 - 5 = 15$, answer is 15

variations

You can use more dice and say how many to add to 25; 30; 50 or 100



practicing doubles

- Play with a friend
- Throw a single dice, then double the value and add 1
- The winner is the person with the highest number
- Play again

example



Throw a

Double 6 is 12 then add 1 = 13

variations

- Subtract 1 from the number and then double it e.g. throw a 5. Subtract 1 is 4, double 4 is 8
- Make up your own variations



naughty threes

Practice addition / skip counting in 5s

- Play with a one or two friends
- Take turns to throw both dice
- Players only score when two identical numbers are thrown (two 1's, two 2's and so on)
- First player to 50 wins

Throw...					
Two 1s	Two 2s	Two 3s	Two 4s	Two 5s	Two 6s
5 points	5 points	wipe out score and start again	5 points	5 points	25 points

variations

Change the target number





beat that!

Skill: Place value, 2 digit addition & estimation	You need: 2 dice, scrap paper per pair	Work: with a partner
Source: Activity Village http://www.activityvillage.co.uk/beat_that.htm		

- Roll the dice. Make the biggest 2-digit number possible by using the numbers for the tens and ones places
- Write down your number under your name on paper
- Pass the dice, and challenge your partner to "Beat That!"
- Have 3 turns each
- **ESTIMATE** who you think will have the biggest score
- Then add up your numbers and your partner's numbers
- Check and compare your answers
- Was your estimate correct?

example

If you roll a  and a , the biggest number you can make is a 6 in the tens place and a 4 in the ones place

variation

Try making the smallest number possible



run for it!

A simple game of sequences (runs) which has the added bonus of helping learn the 5 times table.

Skill: Recognising numbers and sequences, early strategic thinking, counting in 5s, addition	You need: 6 dice, paper and pencil per pair	Work: with a partner
Source: Activity Village http://www.activityvillage.co.uk/run-for-it		

- Roll the dice and look for 'runs' (sequences) starting with 1 – e.g. 1-2, 1-2-3, 1-2-3-4 and so on
- Each dice which is part of a run scores 5 points
- There can be more than one run in each roll
- The first player to 100 points is the winner

example 1

We rolled 6 dice and got these



We can make two sequences with these dice:

- 1, 2 (5 points for each dice, total 10 points)
- 1, 2, 3, 4 (5 points for each dice, total 20 points)
- The throw is worth 30 points (10 + 20)

example 2

We rolled 6 dice and got these



- No sequences can be made and no score is recorded



notes



countdown

Subtract your way down to zero to win this fun math game!

Skill: Addition and subtraction	You need: Scrap paper, pencils, 2 dice per pair	Work: on your own or with a partner
Source for both games: http://www.dubbosouth-p.schools.nsw.edu.au/documents/1850935/1863408/dice.pdf		

- Each player writes the number "99" at the top of their paper
- One player rolls both dice
- Add them together
- Then, subtract the sum from their starting number of 99
- After working this out, write the number remaining on the paper
- The next player takes a turn to roll the dice and work out the answer
- The first player to get to zero wins

For example

Roll a  and 
 $4 + 5 = 9$
 $99 - 9 = 90$
 Write 90

variation

- To make the game more challenging and quicker, use three dice
- Use different target start numbers such as 50, 120 and so on
- Multiply 2 dice together and then subtract that from the target number





total three

Skill: Addition, subtraction, multiplication	You need: Scrap paper, pencils, 2 dice.	Work: on your own or with a partner
--	---	-------------------------------------

Take turns to roll the two dice. Each time you roll, do the following calculations:

- Add the two numbers shown on the dice
- Find the difference between the two numbers
- Multiply the two numbers
- Add the three numbers to get a score for that round
- After 10 rounds the player with the highest total is the winner

For example

Roll  and 
 $6 + 3 = 9$
 $6 - 3 = 3$
 $6 \times 3 = 18$
 Score is:
 $9 + 3 + 18 = 30$

variation

To make the activity more challenging use 8, 10, 12 or 20-sided dice

Longer dice games

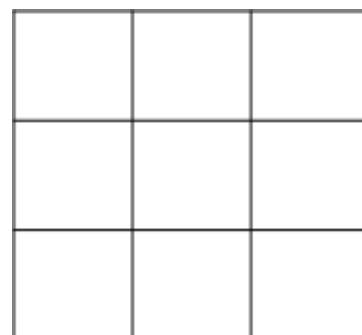
make 12

The aim of this game is to add numbers to make a total of 12 in each box. You need to get three boxes in a line (up, down, diagonal) to end the game.

The game is similar to noughts and crosses / tic tac toe.

Skill: Addition, subtraction and addition strategies	You need: 1 dice, scrap paper, a pencil.	Work: with a partner
Adapted from: NRICH http://nrich.maths.org/7337/index?nomenu=1		

- Draw a 3 x 3 grid like this on scrap paper
- Take turns to throw the dice and write that number in one of the boxes on the grid.
- When it is your turn, keep adding numbers to a box until it adds to **EXACTLY 12**. If the number on the dice will make the numbers add to more than 12, you will need to put that number in another box.
- You can have more than one box on the go at a time
- When a box adds to 12, put a cross through it
- Keep going until one player has three filled boxes in a row or column or diagonal. The game finishes when this happens.
- See the example game on the next page to see how the game plays out



variations

- Add to a bigger number such as 15, 16, 20 etc. (this will make the game take longer)
- Use a bigger grid (this will make the game take longer)
- Start with a smaller 2 x 2 grid for younger learners with a target in the range 5 to 10. They will need to get 2 boxes in a row / column / diagonal to win

make 12 continued

example game play

1

This is a grid of a game between Siya and Deb.



So far, Siya and Deb have one box each that equal **exactly**

12, and they have been crossed out:

Siya – top right, Deb – bottom right



Siya 5 5		Siya 4 3
	Deb 2 4 5	
		Deb 2 2 5 3

2

- It is Siya's turn
- She throws a 
- This is too big for her top left box with the two 5s (as this would make 16, and that is bigger than 12), so she starts another box and writes 6 in it.
- It is Deb's turn, she throws a 
- Her box in the middle has $5 + 4 + 2 = 11$. The one makes this exactly twelve. She can cross out this box and start another.
- Now the grid looks like this.

Siya 5 5	Siya 6	Siya 4 3
	Deb 2 4 5 1	
		Deb 2 2 5 3

3

- In the next few turns, Siya throws a , which completes her top left 5, 5 box
- Then she throws another , which completes her 6 box.
- As she has three boxes in a row, she puts a line through them and wins this game.

Siya 5 5 2	Siya 6 6	Siya 4 3
	Deb 2 4 5 1	
		Deb 2 2 5 3


beetle

The goal is to throw dice to help draw a beetle insect

Skill: Team work, addition	You need: 1 dice, score card* and pencil for each pair	Work: with a partner
Sourced and adapted from: http://www.charnwood-catalogue.co.uk/fundraising.php?info_id=138		

Basic Play

- One player draws the beetle and the other throws the dice
- Throw the dice in order to draw the beetle. See 'Drawing the Beetle' below
- When a pair has drawn a complete beetle, they shout "Beetle" and everyone must **STOP** playing.
- Each pair adds up the number of body parts they have drawn with the maximum being 14. Write this on a scorecard or piece of paper
- Players swap roles and play again.
- Play between 4 or 6 games
- Pairs can add up their scores using any strategies they wish
- The pair with highest score wins

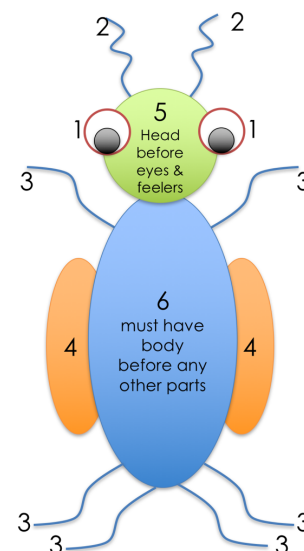
SANC Maths Clubs Beetle Game					
 <p>The round ends when the first pair in the room draws a complete beetle and shouts "BEETLE"</p> <p>The pair adds up their score. 1 point for each part of the beetle drawn. Total of 14 body parts.</p> <p>For Variations, see SANC Games Booklet</p>					
1	2	3	1		
			2		
			3		
SCORE	SCORE	SCORE			
4	5	6	4		
			5		
			6		
SCORE	SCORE	SCORE			
Name				Total Score	

Sample Score Card

Drawing the beetle

There are 14 body parts - body, head, 2 wings, 6 legs, 2 feelers, 2 eyes

- you must throw a 6 to start - and you can then draw the **BODY**
- throw a 5 - draw the **HEAD** - must be drawn before eyes & feelers
- throw a 4 - draw the **WING** (2 of these)
- throw a 3 - draw a **LEG** (6 of these)
- throw a 2 - draw a **FEELER** (2 of these). Must have the head first
- throw a 1 - draw an **EYE** (2 of these) Must have the head first



Extension activities

- Before each pair adds up scores, the whole group can **estimate** which pair they think has the highest score and lowest score. Discuss strategies
- Then each pair adds up their score and hand to another pair to check
- Check actual scores against estimates

* Scorecard file called **MCR - Beetle game scorecards** can be found at <http://www.ru.ac.za/sanc/mathsclubs/clubresources/games/>

beetle game variations







Practice doubling

Score as above but double the scores at the end

Practice counting in multiples and using other adding strategies

Instead of getting 1 point per body part, use the actual values of each body part as the score. This is much harder but gets the learners thinking. The maximum score will then be 43.

For example

Values					
Body	Head	Eyes	Feelers	Legs	Wings
6 	5 	1 	2 	3 	4 

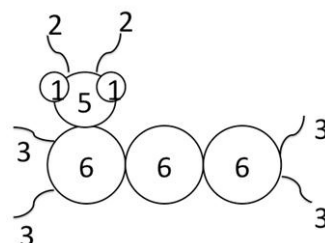
Draw crazy creatures

- Throw the dice **12 times** and draw the creature that you get.
- Add up the values of the body parts drawn..

example







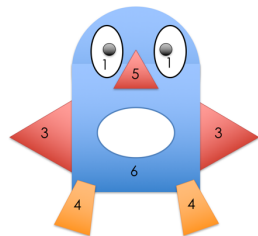
I threw: three 6s, four 3s, one 5, two 2s and two 1s, to get a score of 41

$$\begin{array}{r}
 5 + \quad 6 \times 3 + \quad 3 \times 4 + \quad 1 \times 2 + \quad 2 \times 2 \\
 5 + \quad 18 + \quad 12 + \quad 2 + \quad 4 = 41
 \end{array}$$



Draw other creatures

Such as a penguin and start by throwing a six for the body

1 	2 	3 	4 	5 	6 	
eyes x 2	roll again	wings x 2	feet x 2	nose	body	



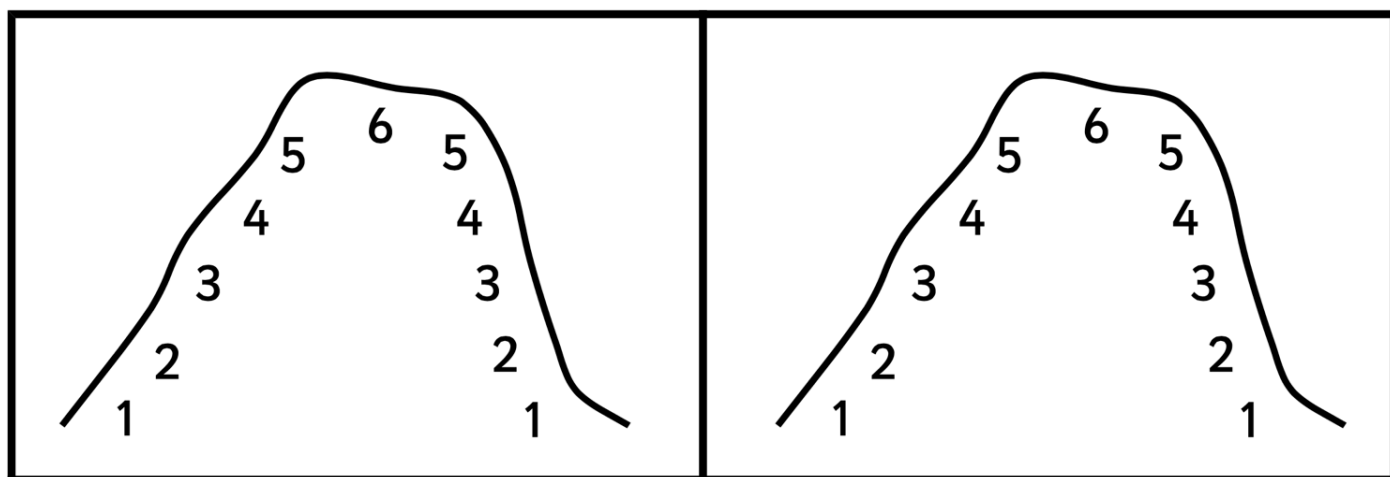
notes

mountain

This simple game makes it ideal for younger players, but with some variations it can be played by all ages. The object of the game is to be the first to climb the mountain, in number order, and then go down the other side.

Skill: Number recognition, manipulating numbers, strategy (variations)	You need: 2 dice per player, paper and pencil, the play board (Tip: Laminate the play boards and use a whiteboard marker)	Work: with a partner
Source: http://www.activityvillage.co.uk/mountain		

- The youngest player starts
- Roll the dice and hope for a 1, which means the player can cross number 1 off the mountain. The player must go up in numerical order, so 2 cannot be crossed off until the 1 is crossed off. If the player rolls a 1 and a 2, both numbers can be crossed off in one turn.
- Play continues until someone has made it all the way up the mountain and down the other side in the correct order



variations

Climb a higher mountain

Increase the height of the mountain (try 9, 10 or 12) and use 3 dice.

Random order

Cross off numbers in random order. One rule, all the numbers on the way up must still be crossed off before a player can begin to go down the mountain. Play with 3 dice and the numbers to 12. Each dice may only be used once (but does not have to be used) in each go



notes



how close to 100?

By drawing arrays, the goal is to fill up the grid to get it as full as possible, using the space as efficiently as possible.

Skill: Multiplication practice using arrays	You need: two six-sided dice, the recording sheet over the page and two different colour crayons or markers TIP: Laminate the recording sheet for re-use and use whiteboard markers	Work: with a partner
Source: Youcubed (https://www.youcubed.org/task/how-to-close-100/)		

- The first player rolls the dice
- Use those two numbers to make an array on the 100 grid

For example

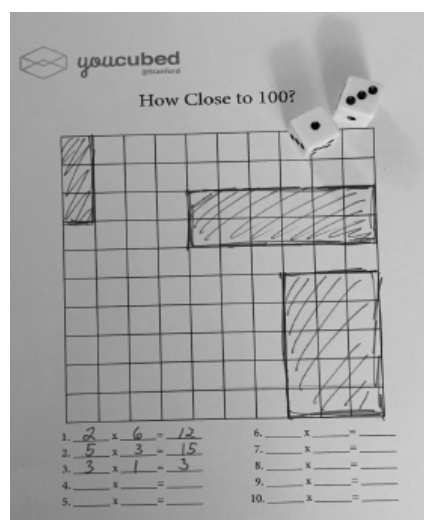
Roll a  and 
so draw a 2 x 6 or 6 x 2 array on the grid

- After the player draws the array on the grid, write in the multiplication sum that describes the array

For example

$2 \times 6 = 12$ or $6 \times 2 = 12$

- The second player rolls the dice, draws the array and writes their multiplication sum
- The game ends when both players have rolled the dice and cannot put any more arrays on the grid.
- How close to 100 can you get? How many squares do you have empty?
- Play again and see if you can use more squares this time



variations

- Each child has a grid of its own. Who can get closest to 100?
- Make grids of 400 and add more dice, or use dice with more sides
- Adapt the game to let the grid represent 100% for older learners



notes

If all the squares in the grid have been used, and all the multiplication sums written, add up all the answers to the multiplication sums. They should add to 100.

how close to 100 grid

1. _____ X _____ = _____

2. _____ X _____ = _____

3. _____ X _____ = _____

4. _____ X _____ = _____

5. _____ X _____ = _____

6. _____ X _____ = _____

7. _____ X _____ = _____

8. _____ X _____ = _____

9. _____ X _____ = _____

10. _____ X _____ = _____

attribution

- **Hug Me Tight** font by Misti's Fonts <http://www.mistifonts.com>
- Playing card images from <https://openclipart.org/user-detail/nicubunu>
- Dice images from <https://openclipart.org/user-detail/rg1024>
- Children on front cover: Carmen Ford, Port Alfred, South Africa

sources of games

This booklet has been compiled using ideas from:

- Games devised and used in SANC Project after school maths clubs and teacher development programmes since 2011
- NRICH <http://nrich.maths.org>
- www.pedagonet.com
- Activity Village www.activitywillage.co.uk
- www.education.com
- http://www.charnwood-catalogue.co.uk/fundraising.php?info_id=138

more resources

Visit

- SANC project website at: <http://www.ru.ac.za/sanc/mathclubs/clubresources/> or
- Our Facebook page: <https://www.facebook.com/RUSANC>



South African Numeracy Chair Project, Education Department
Rhodes University
Grahamstown
6139